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LAKE STATES FOREST EXPERIMENT STATION*

Forest Service U. S. Dept. Agr.

BRUSH FENCES FACILITATE RABBIT SNARING

A method for increasing the effectiveness of rabbit snaring on plantations has been devised on the Superior National Forest by Technical Foreman Janelle. Brush is piled in windrows about 18 inches high, and at intervals of 20 to 30 feet small openings are left in which ordinary rabbit snares are placed. Despite the fact that the brush represents a very low barrier, the animals do not jump over the windrows. This is no doubt due to the characteristic habit of these animals of creeping along under cover so as to keep out of sight of predatory birds. These "brush fences" are built completely around small plantations and swamps; on larger tracts they are spaced about 10 chains apart. The snares are visited daily.

Gratifying results have been obtained wherever this method has been used. Although during the first night or two many rabbits are caught, the number soon falls off until only 3 or 4 of the animals are snared daily. Previous to the development of this method, snaring was effective only during the winter months when the snares could be placed in well-defined trails. The snaring of ruffed grouse and other game birds is avoided by knotting the wire of the noose in such a way as to prevent the snare from closing more than is necessary to catch rabbits.

Chicken wire in 18-inch sections could possibly be used instead of the "brush fences". Fences thus made would probably be cheaper and would have the advantage of portability as well.

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* Maintained in cooperation with the University of Minnesota at University Farm, St. Paul, Minnesota.

WOOD HANDBOOK

The Forest Products Laboratory has recently published a bulletin* on wood and its uses. This handbook should prove a convenient source of information about wood for all users of that product. Architects, engineers, manufacturers, and other users of wood, will find in it much condensed but concise data concerning the properties of wood.

A large share of the contents of this bulletin is devoted to structural grades and working stresses, and a new and very exact method of determining working stresses is given.

The section on timber fastenings contains much information that is often difficult to find in other books on wood.

It is very satisfying to have so much information about wood in one book, and the splendid index which it contains greatly enhances its usefulness.

THE SUPERIOR BRANCH STATION

The Superior Branch Station was established in 1931. The work so far undertaken has been carried out mainly on the Kawishiwi Experimental Forest, a tract of 2,800 acres set aside from the Superior National Forest. Headquarters buildings have been built on the Halfway Administrative site, 13 miles southeast of Ely.

Since the Superior National Forest contains more merchantable timber than any other forest in Region 9, the major emphasis in experimental work has been placed on methods of cutting and means of securing natural reproduction, such as partial and clear cuttings, preparation of the soil for seed germination by burning and mechanical treatment, artificial seeding, and planting. The experiments have been carried on in both upland and swamp black spruce types. Because the soils of this region are generally thin, windthrow is a factor which must be taken into account in all methods of cutting. Over 20 permanent sample plots, covering an area of 70 acres, have been devoted to these investigations.

The younger stands of timber on the forest occupy much land where inferior aspen and paper birch are the dominant

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* *Wood Handbook*, prepared by the Forest Products Laboratory, U. S. Department of Agriculture, Madison, Wisconsin.

or only species present. In other places where desirable species occur, the stands are so dense that the growth of the better trees is slow. All of these types present substantial problems. Release cutting experiments have been made in aspen overtopping spruce and Norway pine; jack pine thinning plots have been established; and the conversion of inferior stands by planting has been investigated. The conversion experiments, which include release cuttings and planting, cover about 50 sample plots totalling over 100 acres.

The importance of obtaining seed for planting from proper sources is being studied in an 18-acre planting experiment in which Norway pine and Scotch pine seed from over 200 widely scattered sources has been used. This is the most successful recent plantation in the district and should be of great interest as the individual trees develop and assert their hereditary characteristics. Some evidences of racial differences can already be seen.

The Superior, as well as other branches of the Station, has been extensively used during the past few years as a training ground for CCC foremen assigned to forest cultural work.

The Superior National Forest contains extensive forests of jack pine and spruce interspersed with lakes and swamps.

CANADIAN PLANTING OBSERVATIONS*

Early forest planting in Canada was carried out with exotic species, chiefly Norway spruce and Scotch pine, because neither seed collecting nor nursery activities had been developed at that time. The desirability of using native species was recognized quite early, however, and most later plantations are of indigenous species. Native exotics, Douglas fir, Sitka spruce, and ponderosa pine have been planted in eastern Canada with variable success and eastern conifers and hardwoods have been planted in coastal British Columbia with good success.

The oldest large-scale plantations are in Ontario and Quebec and were established about 20 years ago. Although considerable areas were planted to Norway spruce, chiefly by pulp companies, this species is not held in very high esteem. The author, however, points out instances where Norway spruce has done as well as, or better than, native white spruce planted with it, and advances the opinion that if proper sites had been selected, proper methods of planting used, and adequate care given (most of the planting was on cut-over hardwood land where release work is necessary for success) reasonably good results would probably have been attained. Scotch pine is also in disfavor chiefly because of the poor form produced. The author again points out that most stock of this species was from seed of unknown, but not northern European origin. Several agencies in Canada are conducting planting investigations. The Ontario Government is carrying on experiments with Scotch pine from several of the best strains in northern Europe. The Petawawa Forest Experiment Station is making tests of many hybrid poplars. Attempts have been made to extend the range of black walnut northward.

Thus far, however, none of the exotic species have shown such remarkable qualities of superiority to the native species, either in growth or freedom from disease, as to warrant their general use in plantation work. One exception to this seems to be the European and Japanese larches, as well as the hybrid of these two species.

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* Abstract of *Exotic Trees in Canada,* by G. A. Mulloy, Forestry Chronicle 11 (3): 33-37, September, 1935.

THE WESTERNMOST OUTPOST OF HEMLOCK IN MINNESOTA

Although it is not generally known by foresters, hemlock (*Tsuga canadensis*) originally occurred as scattered individuals or in small groups or stands in various parts of east-central Minnesota. All of the known areas where this species occurred have recently been checked by the Minnesota Forest Service, but to no avail, the trees presumably having been destroyed by the 1918 and subsequent fires.

A recent discovery of hemlock near Mille Lacs by Ranger P. W. Swedberg of the Minnesota State Forest Service, is therefore of considerable interest for not only does this represent a location new to this state but also what is probably the westernmost occurrence of this species in the United States. This group of three trees near Isle, Mille Lacs County, was examined by staff members of this Station on a recent visit to the area. Since very little reproduction could be found and since the area is grazed, it is doubtful if the group can maintain itself unless measures are taken to protect it. The occurrence of hemlock in Minnesota is, of course, only of botanical interest.

THE WEDGE SYSTEM OF PLANTING

The slit method of planting has gained wide use because it is easy, rapid and cheap. Although proof is lacking in this country, it might be well to weigh against these advantages the results of certain European investigations which showed heavy losses after 20-25 years (when the crowns had completely closed) in plantations previously thrifty in appearance. These losses were attributed to the deficient root systems developed by slit-planted trees. On the other hand the wedge or inverted "V" system overcomes the chief undesirable feature of the slit method, the compaction of all the roots into one plane, and although it is approximately twice as slow, may be cheaper in the long run. This method is now being tried out experimentally by the Station in cooperation with the Huron National Forest.

There are different ways of carrying out the wedge system of planting but the essential feature common to all is the leaving of a wedge-shaped mound of earth in the center of the hole, upon both sides of which the roots of the tree are spread. The most satisfactory tool for use with this method

is the No. 2 spade, but the ordinary round-pointed No. 2 shovel and the Michigan planting bar (with smaller stock) are also suitable.

The first system described is satisfactory in furrows on sandy lands.

Figure 1. The spade is inserted in the soil to the full length of the blade, the blade at a 45° angle. The roughly triangular piece of soil is removed.

Figure 2. The shovel is reversed and the blade placed perpendicularly at the near edge of the hole. If it is necessary that the peak of the wedge occur at a lower depth, the spade should be inserted farther down in the hole. A little experience soon indicates the correct point to insert the spade for various species and classes of stock.

Figure 3. The spade is then pushed forward about 30 to 45 degrees, thus forming the wedge-shaped mound of earth.

Figure 4. The tree is placed in position with roots distributed equally on each side of the wedge.

Figure 5. The soil is tamped about the roots.

Figure 6. After the first tamping with the hands the soil is tamped with the heels and evened off to leave a smooth surface around the plant.

Where it is necessary to cut through roots or in fine-textured soils, a clean hole cannot be made unless a series of cuts (4 when using a spade and 6 with the planting bar) must be made 8 to 12 inches deep forming a square or rectangle. Then the blade of the tool is inserted near the center at an angle of about 30° and a triangular piece of soil removed. Next it is inserted from the opposite side in the same manner, another triangular piece of soil removed and the wedge thus formed.

LANDSCAPING AND RECREATION

New emphasis is being placed upon recreation as a factor in the program of forestry in the Lake States. Emergency funds are used for the construction of many camp sites, scenic trails and other recreational facilities. Landscaping is a necessary part of all such development. A bulletin* on this subject, issued by the National Park Service describes how

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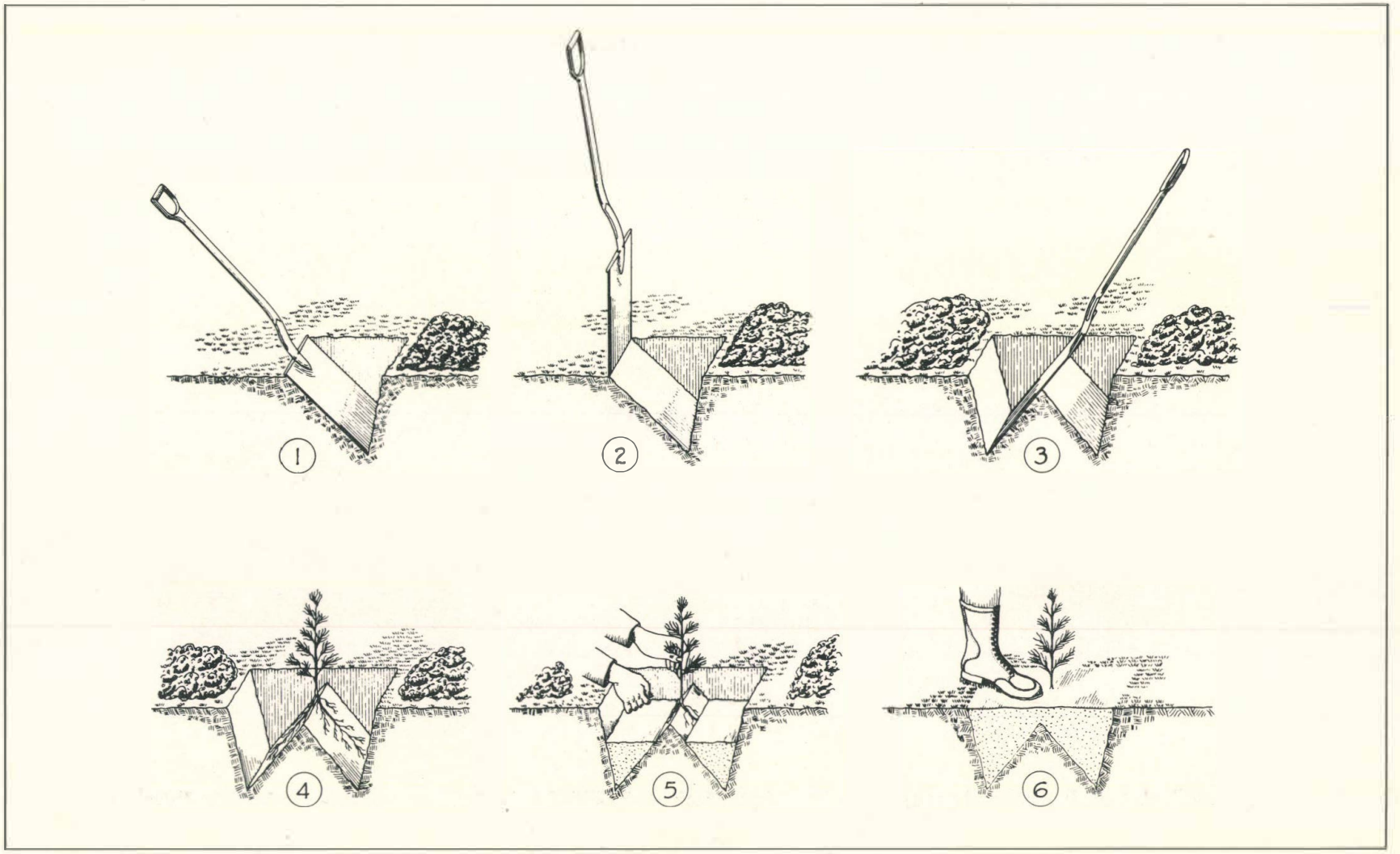
* *Landscape Conservation*, by Frank A. Waugh, National Park Service, Department of the Interior.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to select and plan camp sites. Ease of maintenance is an important consideration in such planning. The location of trails for showing off the scenery to the best advantage is also explained. Throughout the bulletin the aesthetic viewpoint in planning recreation developments is stressed.

APPLIED SILVICULTURE

A new book* by Professor R. H. Westveld of Michigan State College contains detailed information on applied silviculture for 18 recognized forest regions in the United States and Alaska.

Anyone interested in reading the literature on silvicultural practices in the various forest regions of this country has previously been faced with the task of rounding up a great number of bulletins, pamphlets and magazine articles. Professor Westveld has abstracted the greater part of this literature and presented it in this book of over 400 pages. Because of the character of the compilation it will need rather frequent revision to keep up with current findings.

CULL FACTORS FOR MICHIGAN

The Forest Survey has completed a study of woods and mill cull for each of the important tree species in Michigan. The cull factors which have been developed make allowance for long butts and cull sections commonly left in the woods as well as for shrinkage in milling due to sweep, rot, shake, etc., in merchantable logs.

Woods cull was determined by measurement of about 2,500 merchantable trees on all types of logging operations throughout the state. Mill cull was based on inspection or scale of some 12,000 logs, both in the woods and at mills. Scaling was done on a "straight and sound basis", by James W. Girard, Assistant Director of the Forest Survey. Number 4 common lumber is largely included in the cull by this scaling practice. No deduction was made for number 3 common, as is sometimes done by commercial operators.

The following factors allow for both woods and mill cull

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* *Applied Silviculture in the United States*. Edwards Brothers, Inc., Ann Arbor, Michigan.

in merchantable trees only. Cull in all cases is related to possible use for lumber or ties. Poor quality logs commonly used only for chemical wood or fuel are included in the cull.

Total Cull in Merchantable Trees

Species	South Half Lower Peninsula Percent*	North Half Lower Peninsula Percent*	East Half Upper Peninsula Percent*
Sugar Maple-Old Growth	15	13	19
2nd Growth	10	10	10
Yellow Birch-Old Growth	--	15	20
2nd Growth	--	12	15
Aspen	25	25	25
Red Oak	10	15	15
White Oak	10	10	12
Beech	20	15	20
Soft Maple (red & silver)	15	20	25
Elm	15	10	21
Balsam Fir	10	10	12
Basswood	10	10	21
Black Ash	--	--	19
Paper Birch	--	10	10
White Pine	10	10	10
Norway Pine	10	7	6
Jack Pine	10	7	5
White Spruce	--	5	5
Black Spruce	--	5	5
Hemlock	15	20	21
Tamarack	--	5	5
Misc. Better Hardwoods	15	15	20
Misc. Inferior Hardwoods	20	25	20

* In a few cases, factors are rounded off to the nearest 5 percent.

In using these factors it should be borne in mind that they apply to the gross scale of merchantable trees. Any tree 10 to 17 inches in diameter which would produce a 10-foot log of high quality or a 16-foot log of low quality with a top diameter inside bark of at least 8 inches was considered

merchantable. Larger trees were considered unmerchantable unless they would produce one high-quality or two poor-quality 16-foot logs. These standards were found to conform very closely to present utilization in most of the operations cutting only lumber and ties.

Unmerchantable trees commonly make up 8 to 15 percent of old growth hardwood stands. Inclusion of such trees in the volume estimate would require proportionately larger cull factors.

Since these factors were developed to apply to timber estimates for extensive areas, they should be used with caution where close estimates of specific stands are desired.

SHELTERBELT PLANTING

Aside from maintaining seven field branches, the Lake States Forest Experiment Station acts as the research organization for the Great Plains Shelterbelt Project. The results of last year's investigations are now embodied in a voluminous government publication entitled, "Possibilities of Shelterbelt Planting in the Plains Region", which should be available for distribution any day now.

The current field investigations which are confined to the six plains states deal with: (1) the effect of barriers on wind velocity; (2) examination and classification of soils; (3) study of soil moisture relations; (4) effect of barriers in reducing evaporation over a long period; (5) crop measurements in fields protected by windbreaks; and (6) studies of planting methods.

In addition to these field studies, a great deal of laboratory work is being done in St. Paul. This consists largely of seed testing and developing methods of treating seeds of trees and shrubs so that their germination is increased or hastened.

EFFECT OF BARRIERS ON WIND MOVEMENT

In order to study the changes in wind velocity which tree shelterbelts can be expected to produce, artificial barriers made of boards have been erected at a number of different locations in the shelterbelt zone. It is not possible to find natural shelterbelts which present all the variations of density, height, and orientation and yet which are comparable

in other respects, therefore it was necessary to artificially create replicas of shelterbelts. The barriers are made to represent varying densities of shelterbelts by using a number of different spacings between the boards. The upper seven feet of the boards are left unsupported so that they can move back and forth with the wind. It is realized that these barriers fall far short of representing actual shelterbelts of trees, but there is already evidence that they produce effects which are similar to those generally ascribed to shelterbelts. These barrier studies do not take the place of observations on actual shelterbelts, but only supplement the investigations on existing tree windbreaks.

EXAMINATION AND CLASSIFICATION OF SOILS

This activity, although carried out by the research organization, is more in the nature of a service to the administrative branch of the project. This work has been chiefly concerned with classifying the soils as easy, difficult, and prohibitive for shelterbelt planting purposes. Much of the time of the more experienced men has been spent in training many new shelterbelt assistants so that the work may be done on a larger scale next year. The classification work done this season has undoubtedly saved the expenditure of many thousands of dollars on planting in soils which, with present knowledge, are too difficult to plant successfully.

STUDY OF SOIL MOISTURE RELATIONS

This study is concerned with determining whether or not soil moisture is "conserved" in proximity to shelterbelts. A very large number of samples have been taken and are now being tested in the laboratory for total moisture and hygroscopic moisture contents.

EFFECT OF SHELTERBELTS ON EVAPORATION

Five stations for the measurement of the effect of shelterbelts on evaporation have been established. They are located at Denbigh, North Dakota; Huron, South Dakota; Holdrege, Nebraska; Dodge City, Kansas; and Childress, Texas. Two barriers will be erected at each station, one oriented N-S, and the other E-W. They will be twelve feet high and

496 feet long; six inch boards spaced four inches apart will be used, thus giving a density of 60 percent. The chief objective of each of these stations is to determine what influence these barriers have on the drying power of the wind. In order to study this effect, about 50 specially designed evaporimeters (instruments which measure evaporation) will be located within the "field of influence" of each barrier. It is hoped that these observations can be carried out for two full years at least.

EFFECT OF SHELTERBELTS ON CROP YIELDS

Several outstanding examples of benefit to corn crops in Kansas and small-grain crops in South Dakota and Nebraska were noted this fall. The average of all cases, however, will show a rather small percentage of increase in a zone extending about 10 heights from the trees. The yields were uniformly poor due to disease and extreme climatic conditions and this may explain the relatively small average benefit of shelterbelts.

PLANTING INVESTIGATIONS

Efforts are being made to develop methods of planting and caring for the plantations which will make it possible to plant successfully on some of the soils and sites which are at present classified as too difficult. This work is being conducted in close cooperation with the actual planting activities of the administrative organization.

SEED LABORATORY

At the Station's headquarters in St. Paul, a seed laboratory has been developed. The purpose of this laboratory is to carry out germination tests on seeds to determine their quality. In addition to these routine tests, experimental work with various treatments is done. The seeds of some species do not germinate readily unless special storage or chemical treatments are used to break their dormancy. For each such species it is necessary to develop a special treatment.

This description of the activities of the research organization of the shelterbelt project makes plain the part which research must play in the project.

SPRUCE BUDWORM ON JACK PINE

The spruce budworm which caused such severe losses in the spruce-balsam forests in the east has definitely been identified on jack pine in the Lake States. A recent bulletin* describes the outbreaks of this insect on jack pine. The life history of the insect has been worked out and it appears that the form which occurs in pine is biologically distinct from the spruce form. It was also discovered that "serious outbreaks of the budworm build up on the areas involved and are not the result of invasion from distant sources." Taller trees are more susceptible to infestation than short ones, and consequently the nearer young stands are to large trees, the more likely they are to be attacked. The bulletin suggests certain silvicultural practices which should provide control of the insects.

SURVEY SHOWS INCREASED CUT OF FIREWOOD ON MINNESOTA FARMS

H. G. White

There has been a large increase in the amount of firewood removed from farm woodlots in recent years, according to a field check just completed by the Forest Survey organization of the Lake States Station.

The 1930 Census of Agriculture indicated that 1,162,664 cords of wood were cut on the farms of the state in 1929. Present annual production is estimated by the Station to be 1,744,000 cords - 50 percent more than in 1929.

The average amount of wood produced by the farms reporting in 1929 was 13.3 cords. This was very close to the general average for the United States but was considerably lower than for Wisconsin and Michigan. (See Bar Chart) The average wood production per farm for the entire 185,255 farms in Minnesota was 6.3 cords, which is less than the general average for the country.

The 1935 check of the situation indicates that more farms now use wood and production per farm is larger, namely, 9.3 cords.

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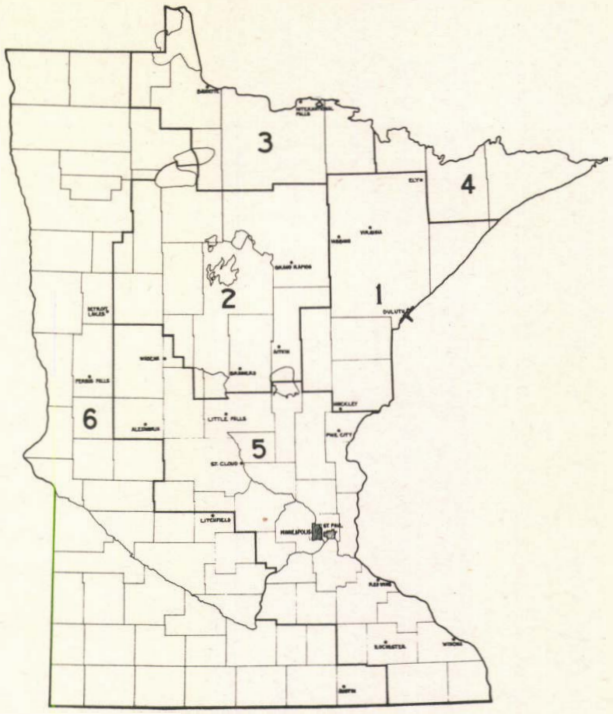
* *The Spruce Budworm on Michigan Pine*, by Samuel A. Graham, University of Michigan School of Forestry and Conservation, Bulletin No. 6.

Economic depression on farms and in cities, alike, undoubtedly accounts for part of the increase in fuelwood production. In prosperous times most city dwellers and many farmers of southern Minnesota use coal and oil for fuel. Lack of ready cash during the past few years has necessitated the resort to woodlot and forest for heating material.



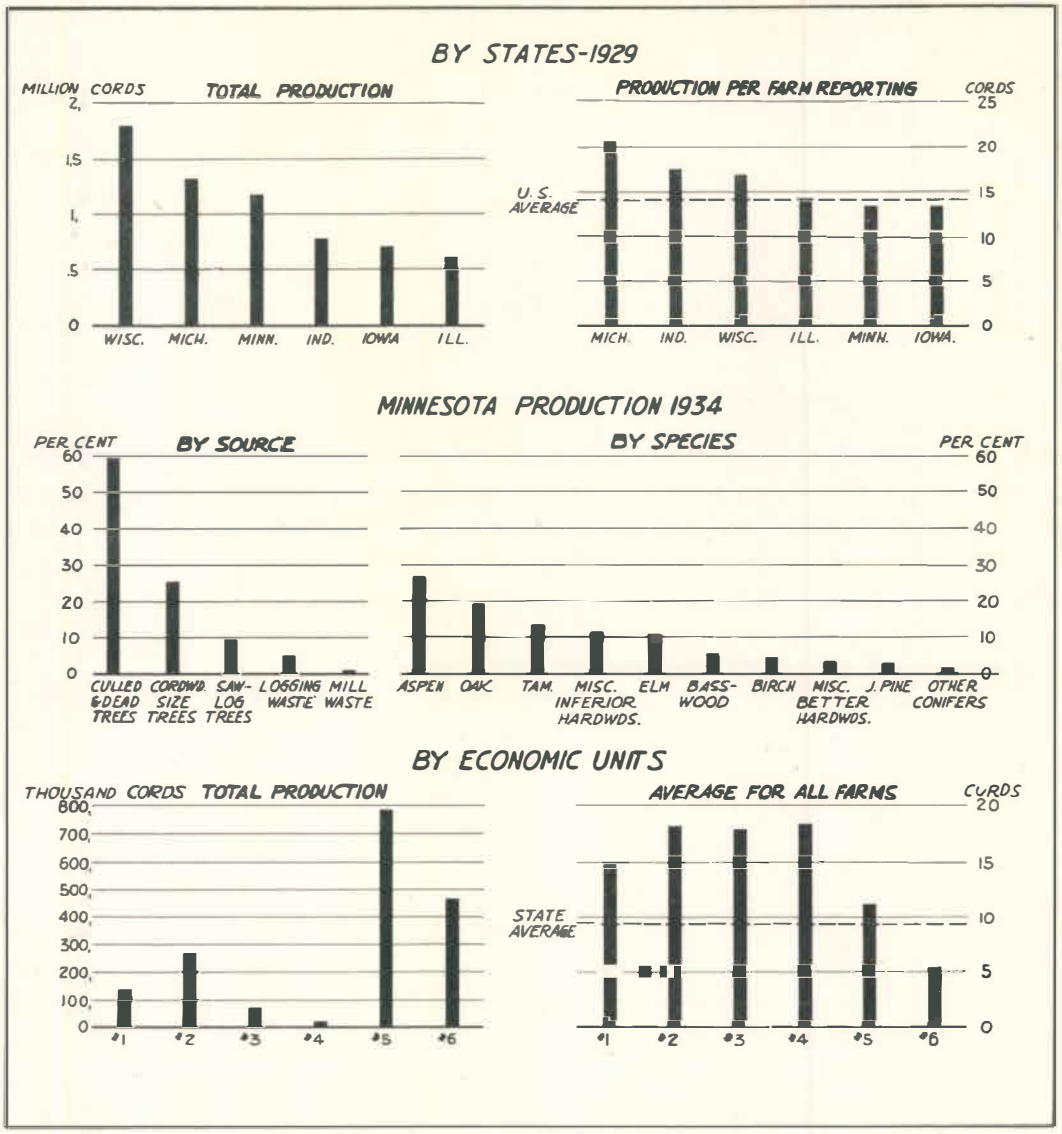
Economic Units in Minnesota

Although the total amount of fuel used is greater, the actual depletion of merchantable timber volume is less than is sometimes supposed. Only 35 percent of the one and three quarter million cords cut in the state was taken from merchantable trees. About 60 percent was obtained from suppressed, unmerchantable, or dead trees; about 5 percent was obtained from logging and mill waste.

Of the volume cut in 1934, 27 percent was aspen, 19 percent oak, 14 percent tamarack, 10 percent elm, and 3 percent jack pine. Miscellaneous hardwoods made up the remaining 27 percent.

Complaints were heard in the southern part of the state that fuelwood supplies are diminishing rapidly. Farmers must go farther for their wood and hauling distance to town in many localities has become too great to permit regular sale of wood for heating and cooking. But scarcity is a matter of price and quality of wood rather than of complete exhaustion of supplies.

On many farms over-cutting for fuelwood together with pasturing the groves is resulting in steady deterioration of woodlots. On the exceptional, well managed woodlot, however, cutting of fuelwood has been used as a means of eliminating the dead and defective material so that the productivity of the area has been measurably increased.



Fuelwood Production in Minnesota

IOWA'S CONSERVATION PLAN

The State of Iowa has prepared a very comprehensive 25-year conservation program.* The plan was originally intended as a recreation plan, but it was soon realized that public recreation as provided by the State was dependent on three inter-

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* *Report on the Iowa Twenty-five Year Conservation Plan*, prepared for The Iowa Board of Conservation and The Iowa Fish and Game Commission.

dependent factors: erosion control, the conservation of surface waters, and the conservation of forest and small cover on the land. The plan, therefore, was broadened and became a conservation plan. Upon this foundation is laid the State's plan for building up the State parks and woodlands, increasing wild life and improving fishing.

Such a well coordinated plan as this in which all the factors are considered and accounted for affords an excellent beginning for extensive conservation efforts, and other States contemplating such work would do well to review Iowa's plan.